D – Efficient Products, Advanced Technologies, and Renewables: Getting Deeper Savings from your ESPC

FEMP Federal Energy Management Program

Overview

- **Objective:**
  - Achieve maximum energy savings from your ESPCs
- **Steps: Agency initiates discussion w/ESCO**
  - Ensure contracts meet minimum purchasing requirements
    - ENERGY STAR® and FEMP-Designated product specifications
  - Achieve deeper savings through underutilized technology
    - FEMP Technology Deployment Matrix
  - Incorporate renewables
    - Renewable energy screenings
    - Power purchase agreements

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Milestones in the ESPC Process

• Acquisition Planning	Phase 1
• ESCO Selection	2
• Preliminary Assessment	2
• Notice of Intent to Award	2
• Request for Proposal	3
• Investment-Grade Audit	3
• Proposal	3
• Task Order Award	3
• Final Design and Construction	4
• Project Acceptance	4
• Post-Acceptance Performance Period	5

Requirements to Purchase ENERGY STAR and FEMP-Designated Products

Agencies are required to purchase ENERGY STAR and FEMP- Designated Products

- **Applies to ESPCs and all purchases of energy-consuming equipment**

- **Legislation and Regulations:**
  - Energy Policy Act (EPAct) of 2005
  - FAR 23.203 – 204
  - FAR 52.223-15 – included in ESPC IDIQ by reference

Summary of Requirements

- **Agencies must purchase ENERGY STAR and FEMP-designated products**
  - ESCOs are aware, but agencies should ensure compliance
- **Applies to all products covered by the two programs (~ 90)**
- **Exemptions (with written determination by agency head) only when there is no ENERGY STAR or FEMP-designated model that:**
  - Meets the agency's functional requirements
  - Is life-cycle cost-effective for application

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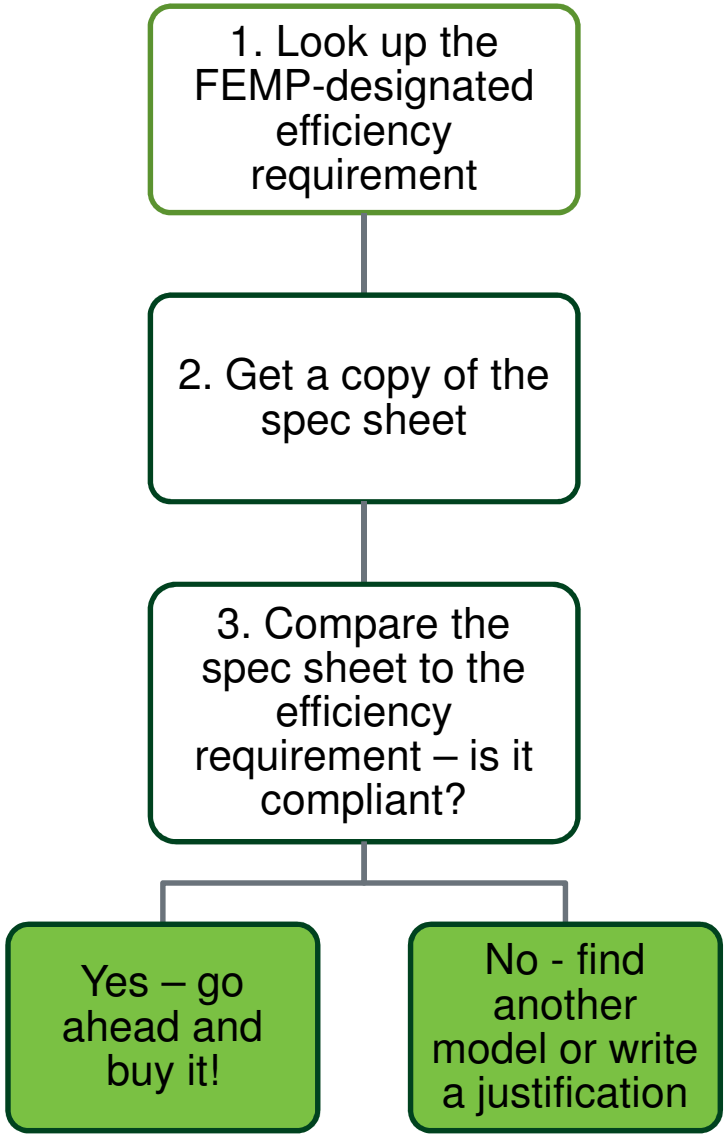
Ensuring Compliance

- Make sure to discuss the requirements with the ESCO early in ESPC process
- Check the FEMP website to see which product types are covered
- Review spec sheets in ESCO's proposal to check whether specified models meet efficiency requirements



What To Do

- Look up the FEMP-designated efficiency requirement
- Get a copy of the spec sheet
- Follow the checklist

Checklist

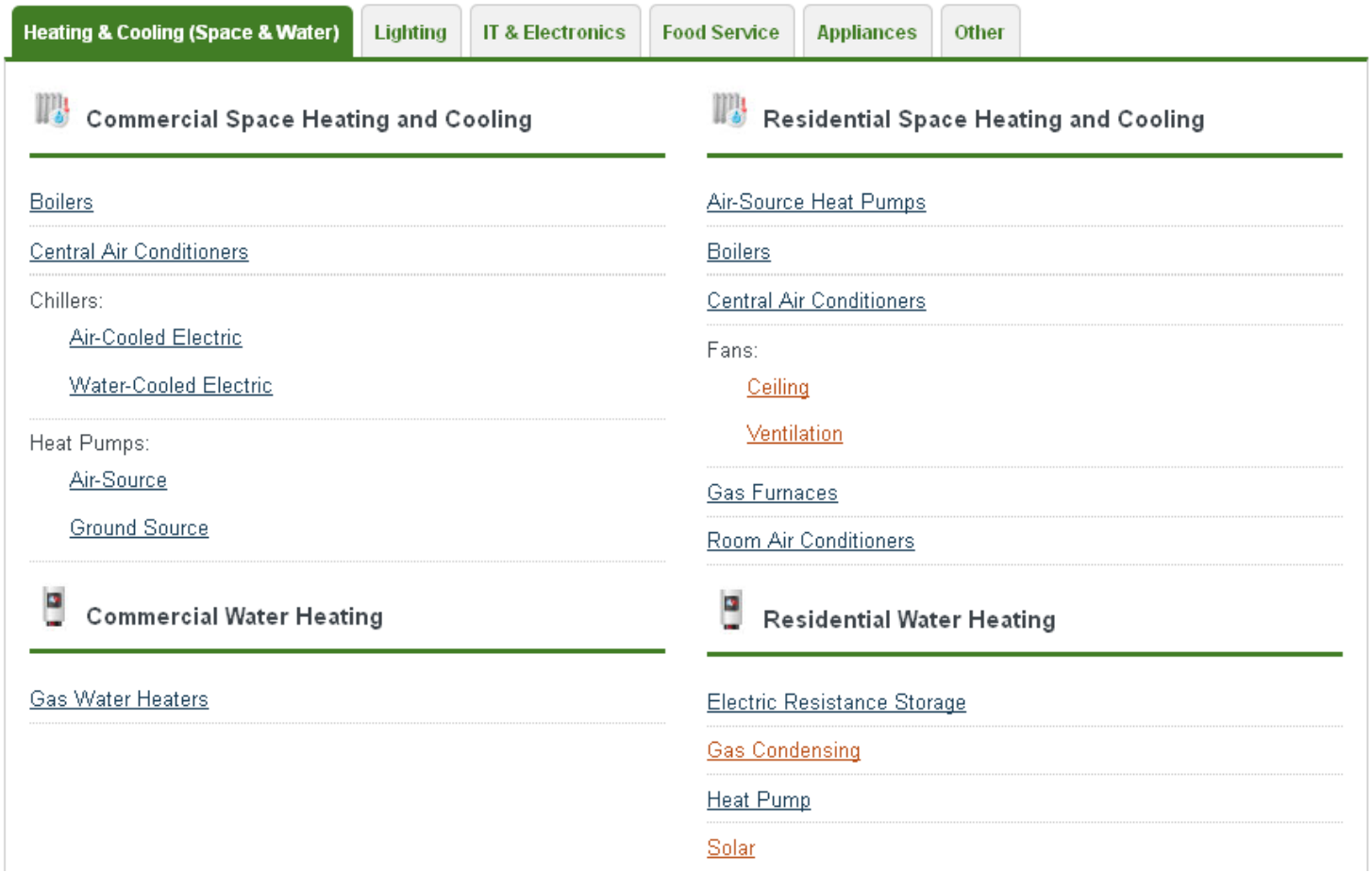
a) Is it the right product type? (EX: water heater)

- Commercial?
- Gas?
- Storage, instantaneous, or hot water supply boiler?

b) Does it meet or exceed the FEMP-designated efficiency requirement?

Look up the FEMP-Designated Efficiency Requirement

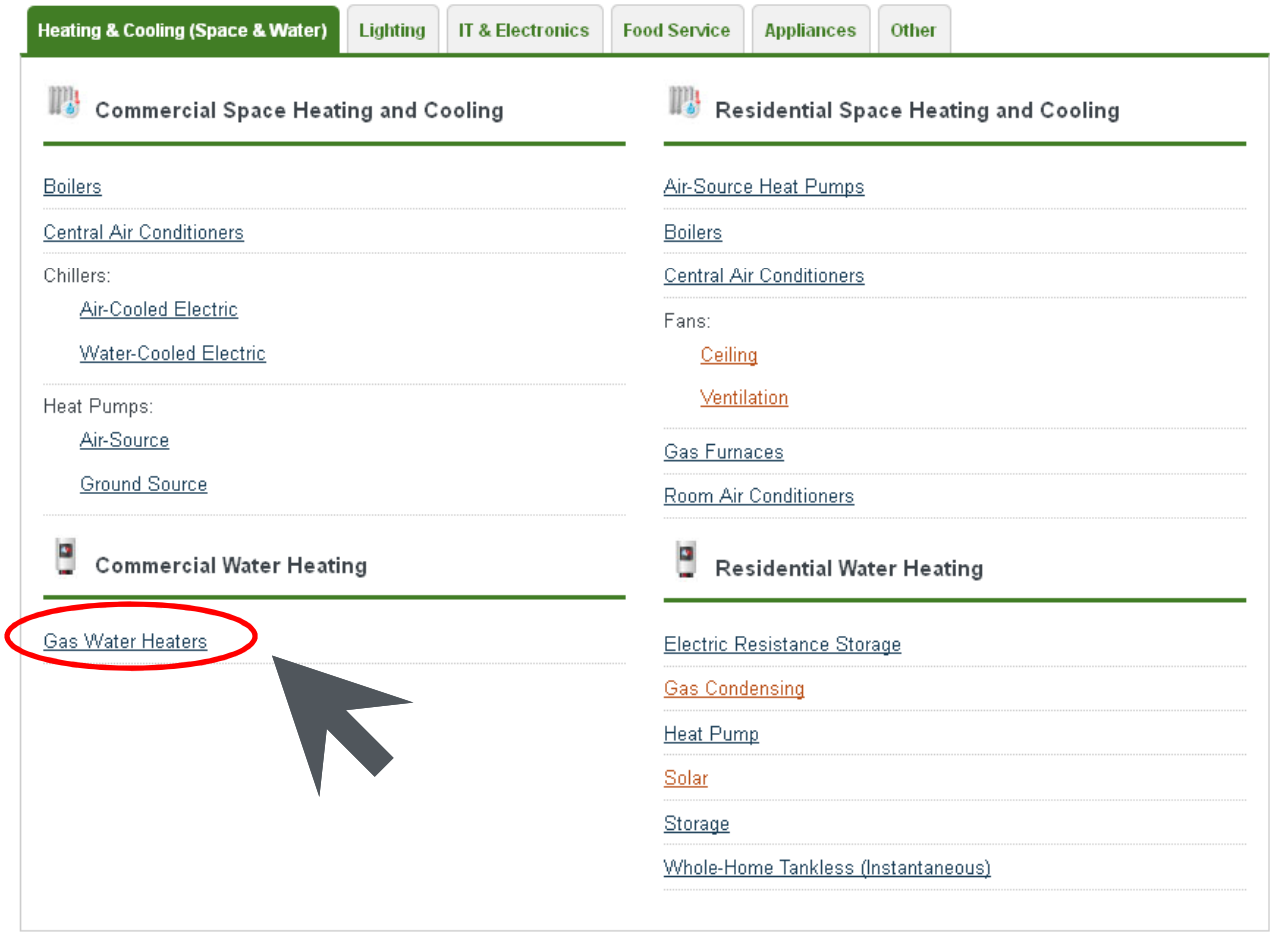
- Visit www.FEMP.energy.gov/coveredproducts



Is the product category covered?

- Select the product type

If it appears on this website, it's covered by either FEMP or ENERGY STAR



Find the Efficiency Requirements Table

FEMP Designated Product: Commercial Gas Water Heaters

Legal Authorities

Federal agencies are required by the National Energy Conservation Policy Act (P.L. 95-619), Executive Order 13423, and Federal Acquisition Regulations (FAR) Subpart 23.2 and 53.223 to specify and buy ENERGY STAR® qualified products or, in categories not included in the ENERGY STAR program, FEMP designated products, which are among the highest 25% of equivalent products for energy efficiency.

Information about energy-efficient commercial gas water heaters in this section includes the following:

- Performance Requirement for Federal Purchases
- Buying Energy-Efficient Commercial Gas Water Heaters
- Buyer Tips
- User Tips
- Cost-Effectiveness Example
- Cost-Effectiveness Assumptions
- Using the Cost-Effectiveness Table
- For More Information

A PDF version of *Purchasing Specifications for Commercial Gas Water Heaters* is also available.

Performance Requirements for Federal Purchases

Product Type	Rate Input (Btu/h)	Thermal Efficiency[a]
Storage[b]	75,000 or greater	94% or greater
Instantaneous[c]	200,000 or greater	94% or greater
Hot Water Supply Boiler[d]	300,000 to 12,500,000	94% or greater

[a] Thermal efficiency is the ratio of heat transferred to water flowing through the water heater to the amount of energy consumed by the water heater as measured by the thermal efficiency test procedure contained in ANSI Z21.10.3-1998.

[b] A self-contained unit that heats and stores water within the appliance at thermostatically-controlled temperature for delivery upon demand.

[c] A water heater with an input rating of at least 4,000 British thermal unit per hour (Btu/h) of stored water.

[d] A packaged boiler with an input rating from 300,000 to 12,500,000 Btu/h (at least 4,000 Btu/h per gallon of water stored) and is intended for heating potable water.

Get a copy of the spec sheet

How? Spec sheets should be included as part of the contractors proposal

This example was downloaded from a manufacturer website and *is not a product endorsement*:

http://www.americanwaterheaternews.com/media/lit/polaris/Polaris_Commercial_Spec_sheet.PDF

american WATER HEATERS

Polaris® High-Efficiency Commercial Gas Water Heater

3-Year Limited Tank/1-Year Limited Parts Warranty*

The Polaris® has a high grade 444 stainless steel tank with brass connections for years of dependable, trouble-free service - no anode required. A submerged combustion chamber with spiral flue provides up to 96% thermal efficiency and ultra-low standby heat loss of approximately 1%.

POLARIS

- **Sealed Combustion with Woven Fiber Premix Burner**
  Metal fiber burner is designed for homogenous combustion in high-intensity blue flame mode. Manufactured of refractory steel that resists corrosion. Excellent resistance to thermal and mechanical shock, even at extreme temperatures. Uniform combustion provides excellent heat transfer. Meets Low NOx requirements for California and Texas.
- **Whisper Quiet Operation**
  Ultra quiet blower and burner minimize noise. Requires 120 volt 60Hz power supply. Draws less than 5 Amps.
- **Power/Direct Vent Using 2" or 3" Plastic Pipe**
  Direct vents up to 120' using PVC, CPVC, or ABS, either Thru-the-Wall or Thru-the-Roof. Optional concentric vent kit available for use Thru-the-Roof or Wall.
- **"Plug-and-Play" Technology**
  No special adjustments are required at initial startup. Connect air inlet, exhaust outlet, water, electricity, and gas. Set the temperature and the system functions properly.
- **External Temperature Adjustment Knob Up to 185°F**
- **Self-Diagnostic Control System**
  Three external LED lights indicate operational status of water heater. Microprocessor monitors nine critical functions. An LED trouble-shooting light, visible through view port, signals heater operation status.
- **Full Serviceability from the Front**
  Removal of two front-located access panels exposes all serviceable components. Modular components are easily removed.
- **Multiple 1" Tank Connections - Brass**
- **Certified to Current Edition of ANSI Z21.10.3/CSA 4.3**
- **Other Features**
  - Thermistor Temperature Sensor
  - Hot Surface Ignition
  - Meets or Exceeds ASHRAE/IESNA 90.1 - Current Standard
  - Complies with California Title 24
  - Factory Installed T&P Valve
  - 24-Volt Thermostat Control
  - Full Flow Brass Drain Valve
  - Zero Clearance to Combustibles
  - Factory Provided Condensate Trap
  - Lightweight with Small Footprint

*For complete warranty information consult the written warranty of American Water Heaters found at www.americanwaterheater.com, or call (800) 426-9800.

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Compare spec sheet to FEMP-designated efficiency requirement

FEMP Designated Product: Commercial Gas Water Heaters

Performance Requirements for Federal Purchases		
Product Type	**Rate Input (Btu/h)**	**Thermal Efficiency[a]**
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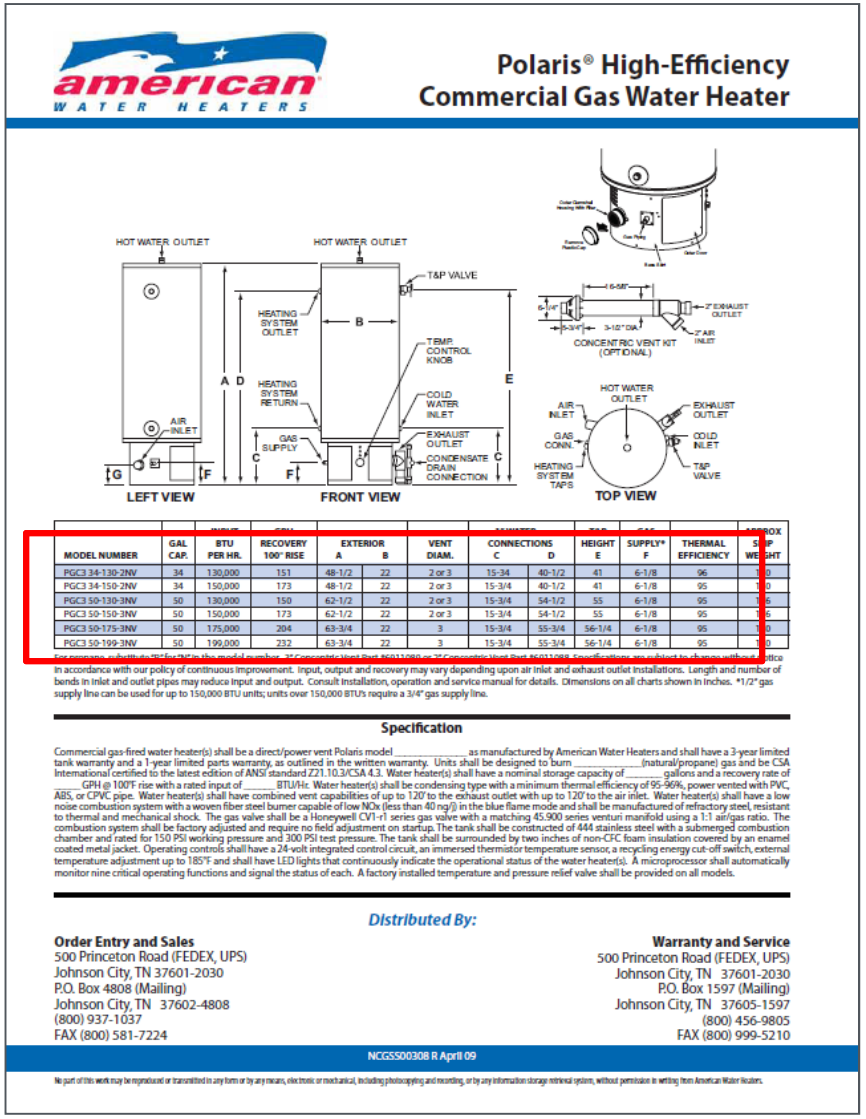

american WATER HEATERS

Polaris® High-Efficiency Commercial Gas Water Heater

MODEL NUMBER	GAL CAP.	INPUT BTU PER HR.	CRV RECOVERY 100° RISE	EXTERIOR A	EXTERIOR B	VENT DIAM.	CONNECTIONS C	CONNECTIONS D	HEIGHT E	GAS SUPPLY* F	THERMAL EFFICIENCY	APPROX SHIP WEIGHT
PGC3 34-130-2NV	34	130,000	151	48-1/2	22	2 or 3	15-3/4	40-1/2	41	6-1/8	96	300
PGC3 34-150-2NV	34	150,000	173	48-1/2	22	2 or 3	15-3/4	40-1/2	41	6-1/8	95	300
PGC3 50-130-3NV	50	130,000	150	62-1/2	22	2 or 3	15-3/4	54-1/2	55	6-1/8	95	306
PGC3 50-150-3NV	50	150,000	173	62-1/2	22	2 or 3	15-3/4	54-1/2	55	6-1/8	95	306
PGC3 50-175-3NV	50	175,000	204	63-3/4	22	3	15-3/4	55-3/4	56-1/4	6-1/8	95	310
PGC3 50-199-3NV	50	199,000	232	63-3/4	22	3	15-3/4	55-3/4	56-1/4	6-1/8	95	310

In accordance with our policy of continuous improvement, input, output and recovery may vary depending upon air inlet and exhaust outlet installations. Length and number of bends in inlet and outlet pipes may reduce input and output. Consult installation, operation and service manual for details. Dimensions on all charts shown in inches. *1/2" gas supply line can be used for up to 150,000 BTU units; units over 150,000 BTU's require a 3/4" gas supply line.

Specification

Commercial gas-fired water heater(s) shall be a direct/power vent Polaris model _____ as manufactured by American Water Heaters and shall have a 3-year limited tank warranty and a 1-year limited parts warranty, as outlined in the written warranty. Units shall be designed to burn _____(natural/propane) gas and be CSA International certified to the latest edition of ANSI standard Z21.10.3/CSA 4.3. Water heater(s) shall have a nominal storage capacity of _____ gallons and a recovery rate of _____ GPH @ 100°F rise with a rated input of _____ BTU/Hr. Water heater(s) shall be condensing type with a minimum thermal efficiency of 95-96%, power vented with PVC, ABS, or CPVC pipe. Water heater(s) shall have combined vent capabilities of up to 120' to the exhaust outlet with up to 120' to the air inlet. Water heater(s) shall have a low noise combustion system with a woven fiber steel burner capable of low NOx (less than 40 ng/J) in the blue flame mode and shall be manufactured of refractory steel, resistant to thermal and mechanical shock. The gas valve shall be a Honeywell CV1-r1 series gas valve with a matching 45.900 series venturi manifold using a 1:1 air/gas ratio. The combustion system shall be factory adjusted and require no field adjustment on startup. The tank shall be constructed of 444 stainless steel with a submerged combustion chamber and rated for 150 PSI working pressure and 300 PSI test pressure. The tank shall be surrounded by two inches of non-CFC foam insulation covered by an enamel coated metal jacket. Operating controls shall have a 24-volt integrated control circuit, an immersed thermistor temperature sensor, a recycling energy cut-off switch, external temperature adjustment up to 185°F and shall have LED lights that continuously indicate the operational status of the water heater(s). A microprocessor shall automatically monitor nine critical operating functions and signal the status of each. A factory installed temperature and pressure relief valve shall be provided on all models.

Distributed By:

Order Entry and Sales
500 Princeton Road (FEDEX, UPS)
Johnson City, TN 37601-2030
P.O. Box 4808 (Mailing)
Johnson City, TN 37602-4808
(800) 937-1037
FAX (800) 581-7224

Warranty and Service
500 Princeton Road (FEDEX, UPS)
Johnson City, TN 37601-2030
P.O. Box 1597 (Mailing)
Johnson City, TN 37605-1597
(800) 456-9805
FAX (800) 999-5210

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Achieving Deeper Savings: Advanced and Underutilized Technology

Benefits of Including Advanced EE and RE Technologies in ESPCs

- Financing of up-front costs
- Better access to rebates and tax incentives
- Performance guarantees
- A partner (the ESCO) who is also invested in the success of the technology
- FEMP assistance and resources, including experts from DOE national labs

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The Technology Deployment Matrix

- Lists ~ 50 new/underutilized technologies with good potential for success in ESPCs or UESCs
- Links to technology reviews
- Saves research time and provides reliable information for choosing ECMs

Navigation to the Technology Deployment Matrix:
FEMP → Technologies → Technology Deployment → Technology Deployment List

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Categories of Technologies in Matrix

- Building envelope
- HVAC
- Lighting
- Water heating
- Combined heat and power
- Refrigeration
- Computer power management

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Top Ten in Technology Deployment Matrix

Rank	Technology	Category	Weighted Score
1	Spectrally Enhanced Lighting	Lighting	91
2	Condensing Boilers	HVAC	86
3	**Combined Heat and Power**	**Power Generation**	**85**
4	Super T8 Lighting	Lighting	79
5	Low Ambient / Task Lighting	Lighting	68
6	Commercial Ground-source Heat Pumps	HVAC	66
7	High R-Value Windows	Building Envelope	65
8	Duct Sealants	HVAC	63
9	LED / Solid State Lighting - Interior	Lighting	61
10	LED / Solid State Lighting - Exterior	Lighting	59

How to Use the Technology Deployment Matrix During ESPC Development

- **As part of acquisition planning, agencies review the matrix for opportunities**
  - If you don't hear about the matrix early in project development, ask your PF or FFS
- **FEMP can schedule a meeting with the agency to go over matrix**
  - Bringing the ESCO into the discussion can speed incorporation

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Advanced/Underutilized Technologies in ESPCs

- Outdoor LED Lighting: Army, GSA, DOE, USCG
- Induction Lighting: Army, GSA, USCG
- Roof Integrated PV: GSA
- EE Fume Hoods: DOE (LANL, ORNL, NETL), USFS
- Variable Refrigerant Volume (VRV) A/C: USCG, USAF
- LED Runway Lights: USCG, FAA
- Turbocor Chillers: USDA, GSA, USCG, NASA
- Aerosol Duct Sealing: Arch. of Capitol (U.S. House of Reps.)
- Biomass Cogen/Boilers: NETL, NREL, ORNL, BoP, DOE
- Bay Source Heat Pumps: FDA
- Cool/Green Roof: DOE, GSA, USGS, USCG
- Wind power: USFS, GSA, DOE

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Keys to Successful Deployment

- **Agency initiative and motivation is important**
- **Technologies may be identified by agency or ESCO**
  - Agency suggestion increases likelihood of incorporation
- **Projects require a mix of motivation and tolerance among project partners**
  - Each partner must be motivated to incorporate the technology – or at least tolerant of it
- **Perceived risks need to be identified and managed**
  - For instance, how should M&V be handled for technology that's only been commercialized for 5-10 years?

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More Keys to Successful Deployment

- **Demonstrations during the investment-grade audit can help reduce risks**
- **Use technology experts from the national labs and private sector to educate stakeholders**
- **Financial incentives can help offset first costs**
  - e.g., many utilities offer “custom” programs that permit incentives for non-standard technologies

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Incorporating Renewable Energy

Renewable Energy (RE) Screenings

- **Screenings offered by FEMP: First-come, first-served (and depending on available funds)**
- **NREL completes high-level screening and report evaluating site's potential resources for RE:**
  - Daylighting
  - Wind
  - Biomass/Alt. methane fuels
  - Geothermal heat pumps
  - Solar – PV, solar thermal, solar water heating, solar vent preheat

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Obtaining a Renewable Energy Screening

- **As part of acquisition planning, agency enters site data on FEMP-provided form**
- **Agency submits completed form to NREL**
- **NREL completes the screening and returns the report in about four weeks**

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Screening Shows Potential Cost Savings and Simple Payback for Renewable Technologies

Technology	System Size	Units	Initial Cost	Annual Cost Savings	Annual Operating Cost	Simple Payback (years)
Photovoltaics	500	nameplate capacity (kW)	$2,761,250	$63,112	$3,616	46.4
Solar Vent Preheat	5,000	area (sq feet)	$184,337	$19,762	$0	9.3
Solar Water Heating	10,000	panel area (sq feet)	$979,227	$67,030	$4,896	15.8
Daylighting	3.5%	skylight/floor area ratio (%)	$531,494	$18,379	$0	28.9
Solar Thermal	10,000	collector area (sq feet)	$819,060	$48,050	$1,939	17.8
Wind Power	500	capacity (kW)	$1,532,592	$44,620	$3,950	37.7

Example Screening Report – Analysis provides detailed results for each technology

PV rating (kW)	500
PV Size (ft^2)	32,024
PV Initial Cost ($)	2,805,000
PV Rebate ($)	43,750
PV Production Incentive ($/year)	0
PV State Tax Credit ($)	0
PV Federal Tax Credit ($)	0
PV Initial Cost w/incentives ($)	2,761,250
Net Metering up to (kW)	0
PV Annual Energy Delivery (kWh/year)	602,712
Capacity Factor (%)	17.9%
PV Annual Utility Cost Savings ($)	63,112
PV Annual O&M Cost ($/year)	3,616
PV Payback Period (years)	46.4

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Power Purchase Agreements (PPAs)

- **PPAs allow agencies to fund on-site RE projects with no up-front capital costs**
  - Developer installs and owns system on agency property, taking tax benefits
  - Agency purchases the generated power, paying for the system over the life of the contract
- **A PPA may be included as an ECM in an ESPC project**
  - Check with FEMP, an FFS, or your PF about current rules and whether a PPA is an option at your site

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Summary: Great Reasons to Consider Advanced EE and RE Technology for Your ESPC

- **Requirements for energy-efficient product procurement**
- **ESPCs are a proven vehicle for deployment of advanced EE and RE**
  - Risk management
  - ESCOs invested in project success
- **FEMP provides support every step of the way**

Agency Motivation Makes it Happen!

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FEMP Assistance and Resources

- **FEMP Web site**
  www1.eere.energy.gov/femp
- **FEMP → Technologies →**
  - → Energy-Efficient Products
  - → Technology Deployment
  - → Renewable Energy

- **FFS, PF, national lab technology experts**

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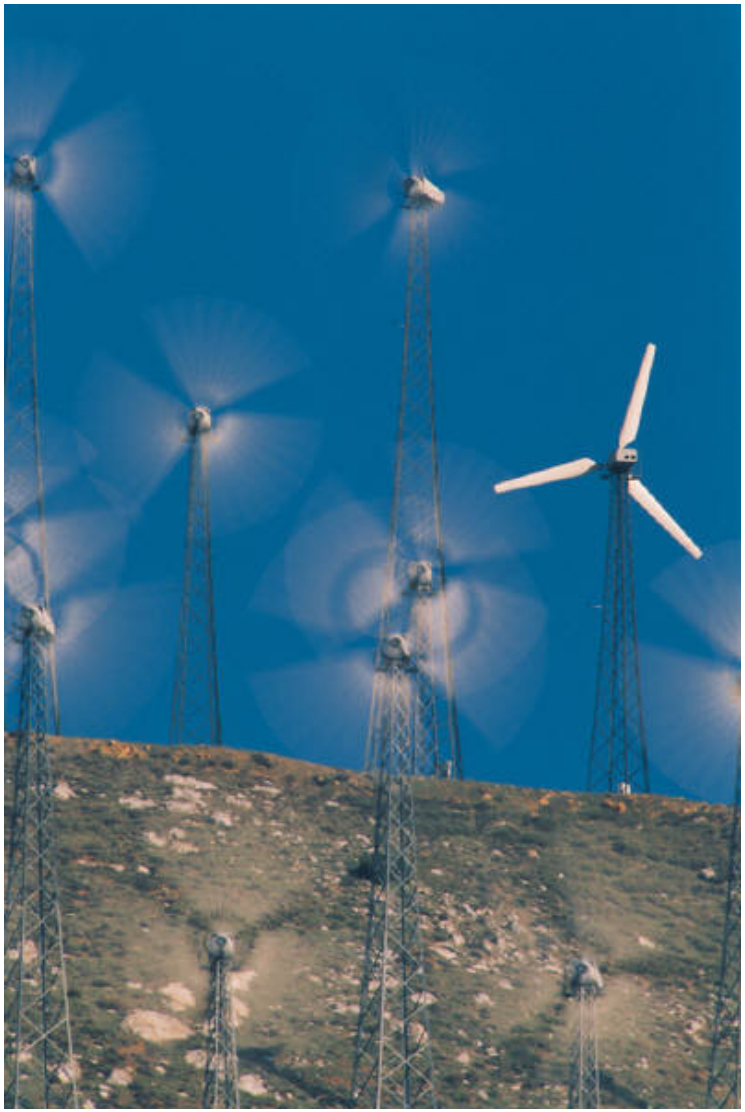

10-Min Break to join your Breakout Group▶

Exercise 1 — Acquisition Planning

10-Min Break to Reconvene▶

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Next Learning Module: E

Phase 2 – ESCO Selection and Preliminary Assessment

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